

In The Claims:

Please cancel claims 1-20 without prejudice, and consider the following new claims 21-32:

21. (NEW) An ignition diagnostic system for an internal combustion engine comprising:

an ignition coil coupled to an electrode gap of an ignition plug;

means for producing a bias voltage across the electrode gap;

a current mirror circuit having an input receiving a buffered representation of an ion current flowing across the electrode gap resulting from the bias voltage and a pair of current mirror outputs producing first and second mirrored currents;

a capacitor; and

a logic circuit directing the first mirrored current to charge the capacitor if the ion current is detected during a first time period prior to generation of a spark across the electrode gap and thereafter directing discharge of the capacitor for fouled plug determination, the logic circuit directing the second mirrored current to charge the capacitor if the ion current is detected during a second time period following generation of a spark across the electrode gap and thereafter directing discharge of the capacitor for combustion quality determination.

22. (NEW) The system of claim 21 wherein the current mirror output producing the first mirrored current has a first current gain associated therewith, and the current

mirror output producing the second mirrored current has a second current gain associated therewith, the first current gain lower than the second current gain.

23. (NEW) The system of claim 21 further including a diagnostic circuit producing an output signal having a pulse width defined by a discharge duration of the capacitor.

24. (NEW) The system of claim 23 wherein the pulse width of the output signal is indicative of a fouled plug condition if the logic circuit directed the first mirrored current to charge the capacitor.

25. (NEW) The system of claim 23 wherein the pulse width of the output signal is a measure of combustion quality if the logic circuit directed the second mirrored current to charge the capacitor.

26. (NEW) The system of claim 23 wherein the logic circuit is configured to direct discharge of the capacitor at a first rate if the capacitor was charged with the first mirrored current, and to direct discharge of the capacitor at a second rate if the capacitor was charged with the second mirrored current, the first rate different than the second rate.

27. (NEW) The system of claim 26 further including:
a first discharge current source producing a first discharge current; and

a second discharge current source producing a second discharge current, the first discharge current greater than the second discharge current;

and wherein the logic circuit is configured to direct the first discharge current to discharge the capacitor for fouled plug determination, and to direct the second discharge current to discharge the capacitor for combustion quality determination.

28. (NEW) The system of claim 27 further including a diagnostic circuit producing an output signal having a pulse width defined by a discharge duration of the capacitor.

29. (NEW) The system of claim 28 wherein the pulse width of the output signal is indicative of a fouled plug condition if the logic circuit directed the first discharge current to discharge the capacitor.

30. (NEW) The system of claim 28 wherein the pulse width of the output signal is a measure of combustion quality if the logic circuit directed the second discharge current to discharge the capacitor.

31. (NEW) An ignition diagnostic system for an internal combustion engine comprising:

an ignition coil coupled to an electrode gap of an ignition plug;

means for producing a bias voltage across the electrode gap;

a capacitor;

a first charging circuit pre-charging the capacitor to a precharge level at the onset of generation of a spark across the electrode gap;

a second charging circuit charging the capacitor based on detection of an ion current flowing across the electrode gap resulting from the bias voltage during a period of time following generation of the spark across the electrode gap; and

a logic circuit directing discharge of the capacitor and producing an output signal having a pulse width corresponding to a duration of capacitor discharge, the output signal having a minimum pulse width in the absence of detection of the ion current, the minimum pulse width corresponding to the duration of capacitor discharge from the precharge level to a lower threshold level.

32. (NEW) An ignition diagnostic system for an internal combustion engine comprising:

an ignition coil coupled to an electrode gap of an ignition plug;

means for energizing the ignition coil;

means for producing a bias voltage across the electrode gap;

a capacitor;

a charging circuit producing a charging current based on detection of an ion current flowing across the electrode gap resulting from the bias voltage just after energizing the ignition coil; and

a logic circuit directing charging of the capacitor with the charging current and thereafter directing discharge of the capacitor, the logic circuit producing an output signal having a pulse width corresponding to a duration of capacitor discharge, the